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CORN STALK AND CORN ROOT DISEASES IN IOWA

AGRICULTURAL EXPERIMENT STATION
IOWA STATE COLLEGE OF AGRICULTURE
AND THE MECHANIC ARTS

BOTANICAL SECTION



Ames, Iowa

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CORN STALK AND CORN ROOT DISEASES IN IOWA

By L. H. Pammel, Charlotte M. King and J. L. Seal.

Although it has been generally believed that corn is less subject to the attacks of fungus than any other agricultural crop, it is estimated that corn smut, corn rust and bacterial disease damage the crops in Iowa to the extent of \$8,000,000 annually. In 1914 the attention of the Botanical section of the Iowa Agricultural Experiment Station was called to a new and important disease attacking corn which was later found to be wide spread in the state, working great damage.

It is important that vigorous steps be taken against corn diseases, for the largest farm crop in the state of Iowa is corn. In the year 1914, in spite of the drouth, serious fungus disease, and other enemies, the yield of corn as given by the United States Department of Agriculture was 389,424,000 bushels. At present prices that crop is valued at \$194,712,000.

Corn has been generally considered less subject to attacks of fungus disease because there have been no wide spread epidemics as with wheat, where rust sometimes destroys more than 50 per cent of the crop. However, such fungus diseases as corn smut, bacterial diseases of corn and corn rust are well known and have long done some damage. That damage is not as great as that inflicted by oat smut which has been estimated to decrease the yield of oats very materially causing a money loss to the farmers of Iowa of about \$7,000,000 annually. Oat rust causes about an equal damage, making a total loss on the oat crop of about \$14,000,000 annually. Corn smut, corn rust and the bacterial disease damage the corn crops of Iowa to the extent of \$8,000,000.

NEW AND IMPORTANT DISEASE OF CORN IN IOWA

The attention of the Botanical section of the experiment station was called to the new and serious disease of corn, early in the fall of 1914 by Prof. H. D. Hughes. He found it on one of the experimental plots of the college farm. Subsequent investigation indicated that this disease was wide spread in the state. This disease was characterized by falling of the corn or the stalks were broken close to the joints. Such plants contained only small ears or they were barren. When a farmer's attention was called to this condition the statement was usually made that the stalks were blown over by the wind or that the trouble was caused by the corn root louse or corn root worm.

A personal field study of the disease was made in the following counties: Story, Boone, Carroll, Harrison, Pottawattamie, Monona, Woodbury, Polk, Lee, Appanoose, Monroe, Davis, Van Buren, Marshall and Clay. Inquiries were sent out to a large number of correspondents, requesting information in regard to the disease. The letters and diseased specimens received show that the disease occurred near the following places: Corydon, Gilman, Nora Springs, Mt. Pleasant, Mt. Ayr, Indianola, Dallas Center, Sanborn, Estherville, Amana, Leon, Maquoketa, Keystone, Armstrong, Clinton, Creston, Peterson, St. Ansgar, Atlantic, Bloomfield, Waukon, Sutherland, Washington, Earlham, Sioux City, Whiting, Council Bluffs and Spencer. This indicates a wide distribution in the state.

YIELD OF CORN IN DISEASED FIELDS

From the figures obtained it appears that the yield in infected fields was reduced from 10 to 15 bushels per acre, or frequently from 25 to 30 per cent.

To illustrate, in some fields 10 stalks out of 22 were attacked; in one field, 23 out of 26 were attacked. In an upland field of corn, said to be fairly good, 41 per cent of the plants were attacked, and the yield was a little over one half of a crop. In many other fields in this vicinity the loss was fully one-third of the crop. In addition, many ears of corn were attacked by a similar mould. The loss from ear rots in Illinois estimated by Burrill and Barrett* was placed at about \$5,620,147 in 1906 and \$2,000,000 in 1907.

The ear rots of corn in Iowa this year probably damaged corn to the extent of \$5,000,000. Considering the loss due to the corn stalk disease these two diseases at a conservative estimate cost Iowa in the neighborhood of \$15,000,000. In many cases badly diseased fields of corn yielded only 10 to 15 bushels of corn per acre. This is certainly a question of considerable economic importance to the farmers of Iowa.

CHARACTER OF THE DISEASE

This disease attacks the roots, the stalks and the ears. It has not been determined whether all these diseases are caused by the same organism or not. The Illinois authorities described four organisms on the ear.

Root Diseases.

During the early part of September in many parts of the state corn was lying on the ground. This was attributed to a severe windstorm. It was, however, soon found that such corn was invariably attacked by a fungus, which had killed the

*Burrill, Thomas J. and Barrett, James F., Ear Rots of Corn. Bull. Ill. Agr. Exp. Sta. 133:69.



Corn field showing results of a fungus attack; many stalks broken near the lower nodes, others prostrate on account of diseased roots.

— (Photograph by Colburn)

roots of the plant. Such roots were always colored reddish and the attacked plants could be pulled easily from the ground. Such roots were completely destroyed.

The Disease on Corn Stalks.

In many fields the corn was broken off just below the joint or above. The pith or soft material in the corn stalk was destroyed, brownish or in some cases reddish in color. The fibers were soft and easily broken off. Such stalks were barren or had only small ears. The small dwarf shoots in the axils of the leaves were frequently decomposed. On the surface of the stalk and in the nodes there was an abundance of the mould*

Ear Rots.

Nearly every farmer has observed an occasional ear attacked by a mould.** These moulds are of three kinds. One attacks the kernels, husks, cobs and sheaths, the threads of the mould occurring through the cobs and sheaths of corn and destroying the kernels completely. This fungus occasionally produces a pinkish color. The second produces a deep pink or red color, the threads of this fungus are felty, and they penetrate the husks, and the kernel becomes brittle and red. The third type attacks an occasional kernel. It is not so serious. Its threads are white.

Diplodia Rot.

A third fungus*** was found on the ears, stems and sheaths, this fungus also occurs on the roots. It is not, however, the cause of the falling of corn.

HOW THE FUNGUS SPREADS

The fungus spreads from the mould on the kernels or from the diseased stalks left in the field.

The disease may have existed in Iowa for some years. The ear rots of corn have long been observed by the Iowa station. A brief note by Selby† of Ohio describes the disease in that state and it was described by the senior author of this circular in the Iowa Agriculturist.††

THE CORN STALK DISEASE IN CATTLE

Numerous complaints have come to us in regard to a disease in cattle which goes under the name of corn stalk disease, or forage poisoning. It was so severe in some parts of the west this past year that some veterinarians have advised farmers

*This was determined as a species of *Fusarium*. Other species of this genus cause wheat scab or blight, flax wilt, cucumber wilt, etc.

**Described by Burrill and Barrett, Bull. Ill. Agrl. Exp. St. 133.

***Bull. Ill. Agrl. Exp. Sta. 133:94-96. Nebr. Agrl. Exp. Sta. 1909:1-20.

†Selby, A. D. Brief Handbook of Plant Diseases Bull. O. Agr. Exp. Sta. 214.

††Vol. 15:153-158 2 f. Nov. 1914.



Stalks of corn weakened by fungus, broken below or above the node.
—(Photograph by Colburn)

not to feed corn stalks. While it is not known that this fungus is connected with this disease in cattle, due to feeding on mouldy corn and fodder, there are good grounds for believing that these moulds are toxic.

Experiments are now being conducted to determine some of these points.

TREATMENT

The only rational treatment is rotation of crops. Corn should never follow corn where this disease exists, since the fungus remains on parts of the plants attacked when corn is planted in the same field the next year. Young plants will become infected. It is a wise plan to treat corn with formalin at the rate of one pint to forty-five gallons of water for fifteen minutes. This will destroy all of the spores adhering to the surface of the corn.

Experiments are under way at the Iowa Station to determine how the fungus grows and under what conditions it attacks the plant.